

Financial Development and International Trade

Is There a Link?

Thorsten Beck

Economies with better developed financial sectors have a comparative advantage in manufacturing industries. A two-sector model shows the sector with large scale economies profiting more than the other from a well-developed financial sector. In countries with higher levels of financial development, manufactured exports represent a higher share of GDP and of merchandise exports—and those countries have a higher trade balance in manufactured goods.



Summary findings

Beck explores a possible link between financial development and trade in manufactures. His theoretical model focuses on the role of financial intermediaries in facilitating large-scale, high-return projects. Results show that economies with better developed financial sectors have a comparative advantage in manufacturing industries.

He provides evidence for this hypothesis, first proposed by Kletzer and Bardhan (1987), using a 30-year panel of data for 65 countries. Controlling for country-specific effects and possible reverse causality, he shows that financial development exerts a large causal impact on the level of both exports and the trade balance of manufactured goods.

This paper—a product of Finance, Development Research Group—is part of a larger effort in the group to understand the link between financial development and economic growth. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Agnes Yaptenco, room MC3-446, telephone 202-473-8526, fax 202-522-1155, email address ayaptenco@worldbank.org. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at tbeck@worldbank.org. May 2001. (40 pages)

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1 Introduction

Among the macroeconomic variables that the empirical growth literature has identified as being highly correlated with growth performance across countries are the level of financial development and the degree of openness.¹ There is also a large literature that studies the issue of causality and the channels through which both financial development and openness affect economic growth.² This paper explores a possible link between financial development and the structure of the trade balance. Specifically, it analyzes theoretically a channel through which the economy-wide level of external finance determines the trade balance in manufactures. It then assesses the empirical validity of this theoretical model in a 30-year panel of 65 countries.

This paper builds on theoretical work by Kletzer and Bardhan (1987) who show that countries with a relatively well-developed financial sector have a comparative advantage in industries and sectors that rely on external finance. We extend their work by allowing both sectors to use external finance, one being more credit intensive due to increasing returns to scale. Furthermore, we test the hypothesis derived from both Kletzer and Bardhan and our work by exploring the impact that financial development has on the structure of the trade balance, specifically, on the export share and trade balance in

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manufactures.

Exploring the link between financial development and trade in manufactures is interesting for several reasons. First, if we find that the level of financial development does have an effect on the structure of the trade balance, this underlines the importance of financial sector development for economic development beyond its positive impact on economic growth and therefore increases the priority that financial sector reforms should have on policy makers' agendas.

Second, exploring the links between financial development and the structure of international trade also has implications for the theory of international trade. The Heckscher-Ohlin model predicts trade flows based on an economy's endowments of labor, land and physical capital. In the Ricardian model technological differences across countries explain international trade flows. This paper explores theoretically and empirically whether cross-country variance in the level of financial development helps predict trade flows, where financial services can be interpreted either as part of the production technology or as determining the level of physical capital in the economy.

Finally, a possible link between financial development and international trade has policy implications. On the one hand, reforming the financial sector might have implications for the trade balance if the level of financial development is a determinant of countries' comparative advantage. On the other hand, the effect of trade reforms on the level and structure of the trade balance might depend on the level of financial development.

While there is a large variety of possible links between financial development and international trade, this paper focuses on just one. It concentrates

on the ability of the financial sector to channel savings to the private sector and therefore help overcome liquidity constraints. This enables the economy to specialize and exploit economies of scale. Economies with a better developed financial system and a higher level of external finance should therefore have a comparative advantage in sectors that exhibit high scale economies. This link, however, might also be demand-driven, so that economies with higher export shares in sectors with scale economies have better developed financial systems. There might finally be a third factor; distortionary government policies might impede both the development of the financial sector and keep the economy relatively closed. While the theoretical model explores this one channel through which financial development affects the structure of trade, the empirical part controls for possible reverse causality and simultaneity bias.

The theoretical part presents the model of an open economy with two production technologies, one with constant returns to scale (food) and the other with increasing returns to scale (manufacturing). Producers of both goods will augment their capital with debt from savers. Market frictions in the form of asymmetric information will give rise to financial intermediaries. Financial intermediaries incur search costs when channeling savings to entrepreneurs. Financial development is modelled as lowering the search costs and thus increasing the level of external finance in the economy. Since financial development shifts incentives of the producers towards the good with increasing returns to scale, the intersectoral specialization, and therefore structure of the trade flows, is determined by the relative level of financial intermediation. All else equal, economies with a better developed financial system are

net exporters of the good with increasing returns to scale.

Our empirical test builds on the assumption that the production of manufactured goods exhibits higher scale economies than the production of agricultural goods or the provision of services. As indicators of trade in manufactured goods we will use manufactured exports, imports and their difference relative to GDP and the share of manufactured exports (imports) in total merchandise exports (imports). As the main indicator of financial development we will use credit to the private sector by deposit money banks and other financial intermediaries as share of GDP.

We test the hypothesis that countries with a higher level of financial development have higher export shares and trade balances in manufactured goods in a sample of 65 countries over the period 1966-95, using both cross-country and panel estimations. To control for biases introduced by country-specific effects, reverse causality and simultaneity, we will use traditional cross-country GMM techniques and recent dynamic panel techniques, proposed by Arellano and Bond (1991) and Arellano and Bover (1995).

The results are very clear. Countries with a better-developed financial system have a higher export share and trade balance in manufactured goods. These results are consistent across cross-country and panel estimations. We conduct a series of robustness tests that confirm these results.

The remainder of this paper is organized as follows. Section 2 presents a theoretical model of financial development and international trade. Section 3 discusses the empirical link between financial development and different indicators of trade in manufactured goods using cross-country and panel estimations. Section 4 concludes.

2 A Theoretical Model of Finance and Trade

This section presents a theoretical model that elucidates one channel through which the level of financial development affects production decisions and both the level and structure of international trade. The model focuses on the role of finance in mobilizing savings and facilitating large-scale and high-return projects. The producers of the good with increasing returns to scale profit from a higher level of financial development more than producers of other goods, since a higher level of external finance allows them to exploit scale economies. This results in a higher production and trade balance of this good in total output in economies with a better developed financial system.³

The economy is populated by a continuum of agents that live for two periods. Each generation is normalized to unity. Agents are born endowed with capital and with the ability to run a production technology that turns capital into consumption goods. Young agents use their capital in the first period to run firms and divide the resulting income qk between first-period consumption and savings, where q is the return on equity.

At the beginning of their second life period agents deposit their savings with financial intermediaries and earn interest $R = 1 + i^D$, which they consume at the end of their lives. In the following we will denote agents of the young generation as entrepreneurs and agents of the old generation as savers.

In the following we will first describe the inter- and intra-temporal consumer problem and the production technologies in both sectors. Then financial intermediation in both sectors is discussed, and the equilibrium in the loan market derived. Finally, general equilibria in the closed and the open economy are described.

2.1 The Consumers

All agents have ex-ante identical logarithmic preferences and a constant subjective discount factor. They maximize the following two-period utility function at the beginning of their lifetime:

$$U = \max\{\ln(C) + \beta \ln(C')\} \quad (1)$$

subject to the budget constraint:

$$C' = (qk - C)R \quad (2)$$

This yields the following first period consumption:

$$C = \frac{qk}{1 + \beta} \quad (3)$$

The logarithmic preferences result in a constant saving rate.⁴

The intertemporal consumption-saving decision is followed by the intratemporal decision about the composition of the consumption bundle. The consumption bundle consists of two goods: a homogenous good x , food, and manufactured goods y_j that are produced in different varieties.⁵

$$C = x^\delta \left(\int_{j=0}^{\omega} y_j^\sigma dj \right)^{\frac{1-\delta}{\sigma}} \quad (4)$$

Due to the Cobb-Douglas form of the consumption function, the consumer will spend the share δ of the consumption budget on food and the share $1 - \delta$ on manufactured goods.⁶ Assuming $0 < \sigma < 1$, consumers always prefer more varieties of manufactures over less. The demand functions for food and for a variety of manufactured goods are:

$$x = \delta(C + C') \quad (5)$$

$$y_j = \frac{(1 - \delta)(C + C')}{p_j^{\frac{1}{1-\sigma}} \int_{i=0}^{\omega} p_i^{\frac{-\sigma}{1-\sigma}} di} \quad (6)$$

where p_j is the relative price of variety j of manufactured goods. The price of food is normalized to 1. Given that a continuum of varieties is produced, the price elasticity of a variety of manufactures y_j is $\frac{1}{1-\sigma}$. Since all manufactured varieties enter demand symmetrically, in equilibrium $p_j = p$.

2.2 The Producers

Each period entrepreneurs have access to a stochastic production technology that enables them to produce either food x or a variety y_j of manufactured goods.

$$x = zi = z(k + l) \quad (7)$$

$$y_j = \alpha zi - T = \alpha z(k + l) - T \quad (8)$$

where k is the entrepreneur's equity, l are loans supplied by financial intermediaries as described below and z is a firm-specific shock with a uniform distribution function $F(z) = \frac{z}{b}$, support between 0 and b and an expected value $\zeta = \int_0^b z dF(z) = \frac{b}{2}$. T are start-up costs, which are considered sunk cost thereafter, and $\alpha > 1$ is a productivity parameter that makes the production of manufactures more efficient than food production.⁷

Whereas the production of food exhibits constant returns to scale, the production process for manufactured goods exhibits increasing returns to scale. Since manufacturing entrepreneurs can differentiate their products without costs and all manufactured goods enter demand symmetrically, each firm will specialize in a different good.

Before production, entrepreneurs and intermediaries will enter into debt contracts as described in the next section. Entrepreneurs will also engage in mutual insurance contracts to diversify their production risk.⁸ After production has been completed, each producer observes privately output and repays debt according to the contract. Finally, the informational asymmetry is resolved, producers can observe each other's output and the insurance agreements are honored.

2.3 Financial Intermediation and the Optimal Debt Contract

Entrepreneurs face two market frictions when they try to augment their equity with debt. First, they are informationally isolated from savers, so that the realization of the firm-specific shock can be observed by savers only through a costly state verification process. Second, savers face search costs that are modelled as iceberg costs; only part of the savings can be actually used by the entrepreneurs as capital. The asymmetric information between savers and entrepreneurs gives rise to financial intermediaries that can internalize the agency problem and diversify the risk perfectly for savers. Whereas the verification costs determine only the costs of external finance, the level of search costs determines both costs and level of external finance available

to entrepreneurs. Any saver can become an intermediary and banks act in a perfectly competitive environment.

Entrepreneurs and intermediaries will enter into a *Standard Debt Contract* that specifies the amount of the loan, the states in which verification takes place and the repayment the firm has to make in different states.⁹ This contract maximizes the firm's profit and ensures that the zero-profit condition for the intermediary holds. The loan size will depend linearly on the firm's equity. The state will be verified whenever the entrepreneur claims that output is too low to pay the fixed repayment due in nonverified states. The intermediary recovers the remaining output after having paid for verification costs that are proportional to output. The truth-telling constraint in the optimal debt problem will ensure that the entrepreneur will always announce the true state.

2.3.1 The Optimal Debt Contract for Food Producers

Defining γ_x as the fixed repayment per unit invested in nonverified states, $R = 1+i^D$ the interest rate on deposits and λ the verification cost, the optimal debt contract is the result of the entrepreneur's maximization problem:¹⁰

$$\max_{\gamma_x, l} \frac{(z - \gamma_x)^2}{2b} (k + l) \quad (9)$$

subject to

$$(k + l) \left[\frac{\gamma_x^2(1 - \lambda)}{2b} + \frac{\gamma_x(b - \gamma_x)}{b} \right] \geq R \frac{l}{1 - s} \quad R, k \text{ given} \quad (10)$$

Equation (9) maximizes the firm's output; since the intermediary recovers the remaining output in the verified states, the expression equals the expected

value of $(z - \gamma)$ for values between γ_x and b times the probability that $z > \gamma_x$.

Equation (10) is the intermediary's financing constraint. Loans are financed with deposits that pay a gross interest of R - an endogenous variable to be determined in equilibrium. The interest rate has to be paid over $(1-s)^{-1}$ of the loan sum, since the fraction s of savings is lost through search costs. The first term on the LHS denotes the verified states, in which the intermediary recovers the remaining output after having paid for verification costs, the second term the fixed repayment of γ_x that the intermediary receives per unit invested in nonverified states.

Next, we define the intermediary's expected return per unit invested.

$$J(\gamma_x) \equiv \frac{\gamma_x^2(1-\lambda)}{2b} + \frac{\gamma_x(b-\gamma_x)}{b} \quad (11)$$

Equation (10) can now be rewritten as follows:

$$(k+l)J(\gamma_x) \geq R \frac{l}{1-s} \quad R, k \text{ given} \quad (12)$$

As shown in the appendix there is a unique γ_x that solves the optimal debt contract and that is independent of the level of equity. The loan size is linear in equity and the debt contract thus independent of the equity level of the entrepreneur.

2.3.2 The Optimal Debt Contract for Manufacturing Producers

The debt contract for the manufacturing entrepreneur is derived very similarly as for the food producer. Defining $\alpha p \gamma_y$ as the fixed repayment per unit invested in nonverified states, the optimal debt contract can be formulated as follows:¹¹

$$\max_{\gamma_y, l} \alpha p \frac{(z - \gamma_y)^2}{2b} (k + l) \quad (13)$$

subject to

$$\alpha p(k + l) \left[\frac{\gamma_y^2(1 - \lambda)}{2b} + \frac{\gamma_y(b - \gamma_y)}{b} \right] \geq R \frac{l}{1 - s} \quad R, k \text{ given} \quad (14)$$

Defining the intermediary's expected return per unit invested $\alpha p J(\gamma_y)$ as for food producers, the intermediary's constraint can be rewritten as follows:

$$\alpha p(k + l) J(\gamma_y) \geq R \frac{l}{1 - s} \quad R, k \text{ given} \quad (15)$$

As in the food sector, there is a unique γ_y that solves the optimal debt contract and that is independent of the level of equity. The loan size is linear in equity and the debt contract therefore independent of the equity of the entrepreneur.

2.3.3 Equilibrium in the Loan Sector

We can now define the equilibrium in the loan market. We denote with Φ the aggregate debt share in the economy $\frac{L}{L+K}$ and with $\phi_i, i = x, y$ the debt share in the food and the manufacturing sector, respectively. Since L is the share of savings not lost in search costs, the share of savings in total assets and the search cost s fix the debt share in our economy and thus for the individual food and manufacturing entrepreneurs, since the optimal contract is independent of the individual wealth.

In equilibrium γ_x, γ_y , and R will be determined endogenously, so that the non-profit conditions for intermediaries (10) and (14) hold with equality and the aggregate equity-debt ratio is consistent with wealth shares. Furthermore,

the deposit interest rate has to be the same on debt contracts with food and with manufacturing producers. The equilibrium in the loan market can be described by the following equations, which determine $\gamma_x, \gamma_y, \phi_x$ and ϕ_y .

$$\frac{J(\gamma_x)}{R_x(\gamma_x)}(1-s) = \phi_x \quad (16)$$

$$\frac{\alpha p J(\gamma_y)}{R_y(\gamma_y)}(1-s) = \phi_y \quad (17)$$

$$R_x(\gamma_x) = R_y(\gamma_y) \quad (18)$$

$$\theta \phi_x + (1-\theta) \phi_y = \Phi \quad (19)$$

where θ is the share of assets in the food sector in total assets in the economy.

The returns on equity for the two classes of entrepreneurs can be written as follows:

$$q_x = \frac{1}{1-\phi_x} \frac{(z-\gamma_x)^2}{2b} \quad (20)$$

$$q_y = \frac{\alpha p}{1-\phi_y} \frac{(z-\gamma_y)^2}{2b} - \frac{T}{k} \quad (21)$$

Whereas q_x is independent of the equity level, q_y is increasing in equity. If T is sufficiently small, there will always be manufacturing entrepreneurs. Producers in both sectors will always prefer to produce rather than to forego the production opportunity and will always prefer production with debt to production in autarchy. As shown in the appendix, $\gamma_y > \gamma_x$ and, therefore, the debt share in the manufacturing sector is higher than in the food sector.

2.4 Equilibrium in a Closed Economy

In equilibrium loan, product and factor markets have to clear. Having described the loan market equilibrium in the previous subsection, we will first present the conditions for the product and factor markets and then define the equilibrium.

Since the production function for food exhibits constant returns to scale, marginal and average costs (c_{xx}, c_x) have to equal its price.¹²

$$c_x(\gamma_x) = c_{xx} = (1 - \phi_x)q_x + \phi_x J(\gamma_x) = 1 \quad (22)$$

Since the manufacturing sector is characterized by monopolistic competition, marginal cost equals marginal revenue.¹³

$$\sigma p = c_{yy} = (1 - \phi_y)q_y + \phi_y \alpha p J(\gamma_y) \quad (23)$$

Free entry drives profits down to zero, so that in equilibrium average costs equal price:

$$p = c_y = (1 - \phi_y)q_y + \phi_y \alpha p J(\gamma_y) + T/y \quad (24)$$

The shares of the entrepreneurs in both sectors have to add up to one and the entrepreneurs have to be indifferent between producing in the food or in the manufacturing sector.

$$q_y = q_x \quad (25)$$

Equations (22)-(25) specify the long-run equilibrium conditions for firms. To obtain equilibrium in the product markets, the relative demand for food

has to equal the relative supply.

$$\frac{x}{y} = \frac{\delta p}{1 - \delta} \quad (26)$$

We can now state the equilibrium result for the closed economy.

Theorem 1 *In equilibrium there will be a unique solution for $x, y, p, q_x, \theta, \gamma_x, \gamma_y, \phi_x$ and ϕ_y which is defined by (16)-(19) and (22)-(26). The share of entrepreneurs in manufacturing decreases in the search costs for financial intermediaries.*

As shown in the appendix, lower search costs increase the return for entrepreneurs in the manufacturing sector more than in the food sector. Manufacturing entrepreneurs profit more from a higher level of external finance and therefore physical capital since they can exploit scale economies. Food producers also profit from a higher debt share, but not from the higher capital stock that it implies. Financial development in the form of lower search costs will therefore shift the production incentives in favor of manufacturing goods resulting in a larger manufacturing sector.

2.5 Equilibrium in an Open Economy

Consider now a world of two countries that have identical size, preferences and technologies. They only differ in levels of financial development, determined by search costs s . There will be two sets of equilibrium conditions, as defined by (16)-(19) and (22)-(25).

In the following we will concentrate on equilibria with no sectoral specialization, so that both economies produce food and manufactured goods. In

the presence of frictionless international trade, all varieties of manufactured goods are available to domestic consumers. Domestic and foreign producers will produce different varieties, so that, independent of intersectoral trade, there will be intrasectoral trade in manufactured goods.

The equilibrium condition in the world-wide goods market can be described as follows:

$$\frac{x + x^*}{y + y^*} = \frac{\delta p}{1 - \delta} \quad (27)$$

where * denotes the foreign country.

The efficiency of the financial sector relative to the rest of the world determines the comparative advantage of the economy and therefore the composition of the trade flows.

Theorem 2 *If, everything else equal, the domestic financial intermediaries face higher search costs than the rest of the world, the economy will be an exporter of food and a net importer of manufactured goods.*

This result corresponds to the predictions of a Ricardian trade model. A well-developed financial system translates into a technological advantage in the production of manufacturing goods. Countries with a high level of financial development therefore have a comparative advantage in manufacturing. A more efficient financial system therefore not only increases the relative production share of manufactured goods, as in the closed economy, but also the export share and the trade balance.

This result also corresponds to the conclusions derived by Kletzer and Bardhan (1987). In their models the country with the higher cost of credit

or more credit rationing imports the good whose production requires external finance and exports the good with no need of external finance. While Kletzer and Bardhan model differences in credit markets by either variation in the perceived default probability of the borrowing country or variation in verification costs, we model the differences in the efficiency of intermediating funds from savers to borrowers.

We can interpret this result also in the context of the “new trade theory”. If both countries are of the same size, the country with the lower search costs will have the larger capital stock. This allows this country to better exploit scale economies and therefore translates into a comparative advantage in the good with scale economies.¹⁴

These results provide us with the following testable hypothesis: *Everything else equal, a higher level of external finance results in a higher export share and trade balance of goods that have relatively high scale economies.*

3 Financial Development and Manufactured Trade in a 30-Year Panel

This section assesses the hypothesis from the theoretical model in a 30-year panel of 65 countries. As in the theoretical model, we will focus on manufactured goods as the goods with increasing returns to scale and intrasectoral trade, for two reasons. First, this is a standard assumption in international trade theory¹⁵ and empirical evidence supports that at least some of the manufacturing industries have increasing returns to scale.¹⁶ Second, our model focuses on scale economies due to increasing returns in capital. While other

sectors such as agriculture and natural resources might also exhibit scale economies, these are mostly due to increasing returns in land or labor.¹⁷

We will therefore focus on the causal link between financial development and the trade in manufactured goods. This section first describes the data. We then present results from cross-country regressions of manufactured trade on financial development. Finally, we discuss results from panel estimations.

3.1 The Data

The sample consists of data for 65 countries over the period 1966 and 1995. In the following we describe the measures of financial development and trade in manufactured goods as well as the variables included in the set of conditioning information.

Since the model concentrates on the mobilization of savings and the allocation of these resources to the private sector as the main function of the financial sector, we would like to use a corresponding measure of financial development. Since there are no such accurate and comparable indicators available for a large cross-country sample and over a longer time-span, we have to rely on a proxy variable. We will use PRIVATE CREDIT, which is defined as credit to the private sector by deposit money banks and other financial institutions as a share of GDP as our main indicator of financial development.¹⁸ Although it measures only part of the mobilized savings, it measures the part that is channeled to private firms. Although it is not a direct measure of efficiency, it captures part of it, since it excludes credit to the private sector by the central bank, assuming that the latter is less efficient than private intermediaries in allocating resources.¹⁹

Although the theoretical model makes predictions only about exports and the trade balance in manufactured goods, we will use manufactured imports as an additional trade indicator, both as a robustness check and to test for the validity of alternative hypotheses. We will use two groups of measures that capture the size of exports and imports in manufactured goods. The first group comprises real manufactured exports, imports and the difference between both relative to real GDP. The second group consists of manufactured exports and manufactured imports relative to total merchandise exports and total merchandise imports, respectively.²⁰

Table 1 presents descriptive statistics and correlations between the variables. There is considerable variation in PRIVATE CREDIT, ranging from a low of 5% in Ghana to a high of 146% in Switzerland. Manufactured exports also show substantial variation across countries. Whereas Rwanda's share of manufactured exports in GDP was 0.04%, Belgium's share was 42%. Similarly, Nigeria's share of manufactured exports in total merchandise exports was 0.5%, whereas Japan's share was 95%. There is a positive and highly significant correlation between PRIVATE CREDIT and manufactured exports in both GDP and in total merchandise exports and the ratio of the manufactured trade balance to GDP.

To assess the strength of an independent link between financial development and trade in manufactured goods we include a set of control variables. To control for the effect of distortionary governmental policies on both financial development and international trade we use the **black market premium**.²¹ We include the log of the **initial level of real per capita GDP** to control for a causal link from the income level to trade. We use the **ini-**

tial real capital per capita to control for capital deepening. Finally, the growth rate of terms of trade and total population are included as exogenous determinants of the trade shares. We expect countries with a positive growth rate of terms of trade to experience a larger trade balance and larger countries to have lower export and import shares.

3.2 Financial Development and Manufactured Trade in a Cross-Section of Countries

The pure cross-sectional analysis uses data averaged over 1966-95, so that there is one observation per country. Specifically, we estimate the following regression:²²

$$MANUF_i = \alpha_1 FINANCE_i + \alpha_2 CV_i + \epsilon_i \quad (28)$$

where *FINANCE* is PRIVATE CREDIT, *MANUF* is one of the five indicators of trade in manufactured goods, *CV* is the set of conditioning information, and ϵ is the white-noise error.

We present results using both Ordinary Least Squares (OLS) and Instrumental Variables (IV) techniques. Specifically, we use the legal origin of countries to extract the exogenous component of financial development. This allows us to control for the possibility of reverse causality from manufactured trade to financial development. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998) have shown that the legal origin of a country materially influences its legal treatment of creditors and shareholders, its accounting standards and the efficiency of contract enforcement, which in turn

determine the efficiency of financial intermediaries and markets. Furthermore, since most countries have acquired their legal origin through occupation or colonization during the 19th century, we can regard legal origin as exogenous variable. We use the Hansen test of the overidentifying restrictions to assess whether the instrumental variables are associated with manufactured trade beyond their correlation with financial development or the other regressors. The regression specification “passes” the test if we cannot reject the null hypothesis that the instruments are not correlated with the error terms.

The results in Table 2 indicate that countries with higher levels of financial development experience larger export shares and trade balances in manufactured goods. PRIVATE CREDIT enters significantly positive in the regressions of manufactured exports and trade balance. While it also enters significantly positive in the regressions of manufactured imports, the coefficient is less than half the size as in the regression of the export share. While PRIVATE CREDIT enters significantly positive in the regression of the share of manufactured exports in total merchandise exports, its coefficient is insignificant in the regression of the share of manufactured imports in total merchandise imports.

The results in Table 3 confirm our previous findings and show that these results are not due to reverse causality or simultaneity bias. Using the legal origin as instrument for PRIVATE CREDIT, we find a strong impact of PRIVATE CREDIT on the share of manufactured exports in GDP and in total merchandise exports and on the trade balance of manufactured goods relative to GDP. The Hansen test of the overidentifying restrictions indicate that we cannot reject the null hypothesis that the instruments are not correlated with

the error terms. Controlling for reverse causality and simultaneity bias, we do not only confirm the significance of our results, but we find an even stronger impact of financial development on manufactured trade, as evidenced by the larger coefficient size in the IV regressions compared to the OLS regressions. PRIVATE CREDIT does not enter significantly in the regression of the share of manufactured imports in GDP and total merchandise imports.

The results in Tables 2 and 3 are not only statistically significant, but also of economic importance. A 10% higher value of PRIVATE CREDIT implies a 16% higher export share and a 14% higher trade balance in manufactured goods as share of GDP. To illustrate the economic importance consider Argentina. Its share of manufactured exports in GDP during 1966-95 was 1.5%, while PRIVATE CREDIT had a value of 16%. An exogenous increase in financial development to the sample mean of 40% would have resulted in a share of manufactured exports in GDP of 6.5%. Similarly, Argentina's share of manufactured exports in total merchandise exports would have been 64% instead of the actual 23%.²³

3.3 Financial Development and Manufactured Trade in a Panel

While the cross-country regressions help us determine whether cross-country variation in financial development can help explain cross-country variation in international trade patterns, we would also like to exploit the time-series variation of the data. Furthermore, panel analysis allows us, unlike the cross-sectional analysis, to control for biases due to unobserved country-specific effects. We therefore split our sample into six non-overlapping 5-year periods

and estimate the following regression:

$$MANUF_{i,t} = \alpha_1 FINANCE_{i,t} + \alpha_2 CV_{i,t} + \mu_i + \lambda_t + \epsilon_{i,t} \quad (29)$$

where μ and λ are country- and time-specific effects, respectively, and i and t represent country and time period, respectively. In the following, we will first describe the econometric techniques used to estimate (29) and then the results.

3.3.1 The Econometric Model

To estimate (29) we use the Generalized-Methods-of-Moments (GMM) estimators proposed by Holtz-Eakin, Newey and Rosen (1988), Arellano and Bond (1991) and Arellano and Bover (1995). Arellano and Bond (1991) propose to first-difference (29) to eliminate the country-specific effect. To address the endogeneity problem, they propose using lagged values of the levels of the regressors as instruments. Assuming (a) that there is no serial correlation in the error terms $\epsilon_{i,t}$, and (b) that the explanatory variables are weakly exogenous, we can use the following moment conditions:

$$E[(\epsilon_{i,t} - \epsilon_{i,t-1})X_{i,t-j}] = 0 \quad j = 2, \dots, t-1; t = 3, \dots, T \quad (30)$$

where $X = [FINANCE \ CV]$. We will refer to this estimator as the *difference estimator*.

The *difference estimator*, however, eliminates the cross-country variation of our data.²⁴ To address this conceptual disadvantage and econometric shortcoming of the *difference estimator* we use an alternative estimator that combines in a system the regressions in differences with regressions in levels, as

proposed by Arellano and Bover (1995).²⁵ Blundell and Bond (1998) show that this *system estimator* reduces the potential biases and imprecision associated with the *difference estimator* and performs better in Monte Carlo simulations. The instruments for the regressions in differences are the same as above. For the regressions in levels, lagged differences are used as instruments. The latter are valid instruments under the following assumption: Although there might be a correlation between μ and the levels of the explanatory variables, this correlation is constant over time. The moment conditions for the regressions in levels are thus:²⁶

$$E[(X_{i,t-j} - X_{i,t-j-1})(\epsilon_{i,t} + \mu_i)] = 0 \quad j = 2, \dots, t-1; t = 3, \dots, T \quad (31)$$

The system thus consists of the stacked regressions in differences and levels, with the moment conditions in (30) applied to the first part of the system, the regressions in differences, and the moment conditions in (31) applied to the second part of the system, the regressions in levels.

The consistency of the GMM estimator depends on the validity of the assumption that ϵ does not exhibit serial correlation and on the validity of the instruments. We use two tests proposed by Arellano and Bond (1991) to test for these assumptions. The first is a Sargan test of over-identifying restrictions, which tests for the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation procedure. The second test examines the assumption of no serial correlation in the error terms. It tests whether the differenced error terms are second-order serially correlated.²⁷ Failure to reject the null hypotheses of both tests gives support to the model.

3.3.2 The Results

The results in Table 4 confirm the results from our cross-country estimations. The results show a statistically significant and economically large causal impact of PRIVATE CREDIT on manufactured exports as share of GDP and as share of total merchandise exports and on the trade balance of manufactured goods to GDP. While PRIVATE CREDIT also enters significantly positive in the regressions of manufactured imports as share of GDP, the impact of PRIVATE CREDIT on exports is more than twice as big as the impact on imports. Financial development seems to have a negative effect on the relative importance of manufactured imports. The specification tests indicate that the data do not reject the assumption of no serial correlation in the error terms and the validity of the instruments at the 10% level, except for the regression of manufactured imports as share of total merchandise imports. We note that the coefficients are of smaller size than in the cross-country IV regressions and more in line with the cross-country OLS regressions. This might indicate that the short-term impact of PRIVATE CREDIT on manufactured trade is smaller than its long-run impact.²⁸

3.4 Robustness Tests

Table 5 presents the regression results using total merchandise exports and imports as dependent variables. If the hypothesis from the theoretical model holds, the link between total exports and financial development should be less pronounced than between manufactured exports and financial development. The results in Table 5 indicate a causal impact of financial develop-

ment on total merchandise exports, while there does not seem to be a robust relationship between financial development and total merchandise imports and trade balance. While the results for imports and trade balance in the panel regressions are significant - and negative in the case of the merchandise trade balance -, the cross-country regressions do not yield significant results. Overall, these results indicate that the impact of PRIVATE CREDIT on manufactured exports and the manufactured trade balance is not driven by a high correlation between manufactured exports and total exports.

Our results are not driven by the historic experience of the East Asian countries.²⁹ Leaving out the East Asian countries does not change the size and significance of the coefficients of financial development.

Our results are robust to the use of other measures of financial development. Specifically, we use LIQUID LIABILITIES, the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank intermediaries) divided by GDP, and COMMERCIAL-CENTRAL BANK, the ratio of commercial bank domestic assets divided by the domestic assets of commercial and central banks.³⁰ Using both indicators we find a strong positive impact of financial development on manufactured exports as share of GDP and as share of total exports, and on the trade balance of manufactured goods in GDP.³¹

4 Concluding Remarks

This paper explored the link between the level of financial development and the structure of international trade. A theoretical model with two sectors

showed one possible causal link from the level of financial development to the structure of the trade balance. The sector with high scale economies profits more from a higher level of financial development than the other sector. Economies with a better-developed financial sector therefore have a comparative advantage in sectors with high scale economies and, all else equal, are net exporters of them.

Estimation results from a 30-year panel with 65 countries give support to the predictions of the model. Countries with a higher level of financial development have higher shares of manufactured exports in GDP and in total merchandise exports and have a higher trade balance in manufactured goods. These results are consistent across cross-country and panel estimations.

This paper's results underline the importance of financial development for economic development by looking beyond the link between finance and economic growth. This raises the importance that financial development should have on policy makers' agendas.

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1 See among others Barro and Lee (1994) and Easterly, Loayza, and Montiel (1997).

2 For financial development, see Levine, Loayza, and Beck (2000), for openness see Frankel and Romer (1999).

3 The model builds on a model developed by Khan (1999). The model presented in this paper also owes much to Helpman (1981).

4 Interest rate changes therefore do not affect the saving decisions of agents. This allows us to isolate the effects of financial development on the loan market. Empirical evidence supports the hypothesis that saving decisions are independent of interest rate changes, see for example Loayza, Schmidt-Hebbel and Servén (1998) and Beck, Levine and Loayza (2000).

5 We use food and manufactured goods to denote the two goods as in Helpman (1981), one of the first models with inter- and intra-sectoral trade.

6 We could use any other utility function, as long as it implies a downward sloping relative demand curve.

7 Assuming a more general distribution function requires additional functional assumptions to get the same results.

8 Due to the concavity of their utility functions, entrepreneurs will always insure themselves fully, if offered fair insurance. The lack of insurance arrangements would change the optimal debt contract as described below while retaining its main characteristics. See Khan (1999) for a discussion.

9 See Townsend (1979) and Gale and Hellwig (1985).

10 For a formal derivation, see appendix, available on request. We use γ , which is the gross interest rate times the loan share in total investment, instead of the gross interest rate, since this facilitates the derivation of the

contract. As shown in the appendix, the maximization problem can be rewritten so that γ is the only decision variable, instead of both loan interest rate and loan size, as in the usual set-up. This is comparable to Townsend's (1979) derivation of the optimal contract and follows Khan (1999).

11 For a formal derivation, see appendix. The start-up costs T do not enter the optimal-debt problem since they have to be paid entirely by manufacturing producers before entering the loan market.

12 Due to the insurance arrangement all entrepreneurs face the same ex-post costs.

13 We assume that any variety y_j can be transformed into another variety without costs, so that the insurance arrangements guarantee all manufacturing producers the expected revenues.

14 Compare Krugman (1980).

15 See Young (1928) and Krugman and Obstfeld (1997), ch.6.

16 See Junius (1997) for an overview. Basu and Fernald (1997) report larger scale economies for manufacturing than for the whole U.S. private economy, after controlling for aggregation effects. Antweiler and Treffer (2000) use international trade data to show that while there are manufacturing industries with both constant and increasing returns to scale, most natural resource industries exhibit either constant or very small increasing returns to scale.

17 Engerman and Sokoloff (1997) describe the agricultural activities in the South of the U.S. and in parts of Latin America in the 17th and 18th centuries as involving scale economies in slave labor. Griliches (1963) finds increasing returns to scale in U.S. agriculture. Hayami and Ruttan (1985) report increasing returns to scale for agriculture in developed countries and

constant returns in developing countries. Kislev and Peterson (1986), however, show that the estimates for the developed countries are not robust to the use of country dummies. Furthermore, they cite other evidence against the existence of scale economies in U.S. agriculture.

18 Specifically, we take lines 22d+42d from the IFS, divided by the end-of-period CPI. The GDP numbers are deflated by the yearly CPI. To avoid inconsistency when using a ratio of a stock and a flow variable, we take the average of period t and period $t-1$ of the financial variable and divide it by the real GDP of period t .

19 This or similar measures have also been used by other researchers as an indicator of the level of financial development, as by Levine and Zervos (1998) and Levine, Loayza and Beck (2000).

20 All data on trade in manufactured goods are from the World Development Indicators, while the GDP numbers are from Loayza, Lopez, Schmidt-Hebbel and Serven (1998). Since the data on manufactured trade are in current U.S. dollars, they cannot be deflated by a price index in local currency, such as the GDP deflator or the CPI. We therefore calculate an export (import) deflator from data provided by the World Bank, as ratio of total merchandise exports (imports) in current and in constant US dollars.

21 This variable measures the percentage deviation of the black market exchange rate from the official exchange rate.

22 Both *FINANCE* and *MANUF* are included in logs, so that the results can be interpreted as elasticities. The trade balance is calculated as the difference of the logs of manufactured exports and imports.

23 We use the results in Table 3 for these policy experiments since they

control for possible reverse causality and simultaneity bias. Using the results from Table 2 would yield similar though smaller effects of PRIVATE CREDIT on manufactured trade.

24 This has been criticized, among others, by Durlauf and Quah (1999).

25 Among the other problems with the difference estimator are that (1) lagged levels are weak instruments for a regression in differences, when the explanatory and the dependent variables are persistent over time, which is most likely the case here; (2) differences are less correlated over time than levels which might produce biased estimates if the dynamic structure of estimated model differs from the true model (see Barro 1997); and (3) first-differencing tends to emphasize measurement error over signal.

26 Only the latest possible first differences are used in the respective level regression, since using prior differences would lead to redundant moment conditions, as shown by Arellano and Bover (1995).

27 By construction the differenced error-term is likely to be first-order serially correlated. We cannot use the error terms from the regressions in levels since they include the country-specific effect.

28 The results are based on the second-stage estimations that control for heterogeneity in the variance-covariance matrix. However, Arellano and Bond (1991) and Blundell and Bond (1998) point out that the standard errors of the second-stage results might be biased downwards. We therefore also consider the first-stage results. The results on the first-stage confirm a significantly positive impact of PRIVATE CREDIT on manufactured exports as share of GDP and as share of total merchandise exports and on the manufactured trade balance as share of GDP.

29 Specifically, we eliminated Japan, Korea, Malaysia, Philippines and Thailand from the sample. Results available on request.

30 These measures have been used by other researchers, for example, Levine, Loayza, and Beck (2000).

31 Results available on request.

Table 1: Summary Statistics: 1966-1995

Descriptive Statistics

	Private Credit	Manufactured Exports / GDP	Manufactured Imports / GDP	Manufactured Trade Balance / GDP	Manufactured Exports/ Total Exports	Manufactured Imports/ Total Imports
Mean	39.92	8.03	16.13	-8.10	38.01	65.69
Median	27.51	3.85	14.16	-7.36	31.44	66.99
Maximum	146.41	42.02	59.92	8.37	94.82	82.65
Minimum	4.93	0.04	2.98	-32.85	0.47	29.24
Std. Dev.	30.68	9.03	9.61	8.16	28.52	9.49
Countries	65	65	65	65	65	65

Correlations

	Private Credit	Manufactured Exports	Manufactured Imports	Manufactured Trade Balance	Manufactured Exports/ Total Exports	Manufactured Imports/ Total Imports
Private Credit	1					
Manufactured Exports / GDP	0.550 (0.001)	1				
Manufactured Imports / GDP	0.135 (0.286)	0.618 (0.001)	1			
Manufactured Trade Balance / GDP	0.450 (0.001)	0.378 (0.002)	-0.494 (0.001)	1		
Manufactured Exports/ Total Exports	0.672 (0.001)	0.754 (0.001)	0.182 (0.147)	0.620 (0.001)	1	
Manufactured Imports/ Total Imports	-0.152 (0.228)	-0.101 (0.423)	0.239 (0.055)	-0.393 (0.001)	-0.391 (0.001)	1

p-values are reported in parentheses

Table 2: The Link Between Finance and Manufactured Trade in a 30 Year Cross-Section, OLS

Dependent variable	Manufactured exports / GDP	Manufactured imports / GDP	Manufactured trade balance / GDP	Manufactured exports/ total exports	Manufactured imports/ total imports
Constant	-2.218 (0.030)	2.544 (0.001)	-4.762 (0.001)	0.476 (0.556)	4.231 (0.001)
Private credit ¹	0.957 (0.004)	0.395 (0.025)	0.562 (0.044)	0.572 (0.031)	-0.097 (0.133)
Total population ¹	-0.140 (0.057)	-0.297 (0.001)	0.157 (0.053)	0.077 (0.313)	-0.030 (0.045)
Growth rate of terms of trade	0.007 (0.938)	0.006 (0.924)	0.001 (0.993)	-0.079 (0.509)	-0.006 (0.795)
Initial income per capita ¹	-0.373 (0.191)	-0.037 (0.780)	-0.336 (0.280)	-0.300 (0.288)	0.037 (0.354)
Black market premium ²	-0.951 (0.144)	0.487 (0.174)	-1.437 (0.008)	-1.360 (0.017)	-0.057 (0.569)
Initial real capital per capita ¹	0.451 (0.063)	-0.048 (0.630)	0.499 (0.062)	0.375 (0.129)	0.010 (0.804)
Heteroskedasticity robust p-values are reported in parentheses					
R ²	0.590	0.486	0.564	0.506	0.177
Countries	65	65	65	65	65

¹ In the regression, this variable is included as log(variable)

² In the regression, this variable is included as log(1 + variable)

Table 3: The Link Between Finance and Manufactured Trade in a 30 Year Cross-Section, IV

Dependent variable	Manufactured exports / GDP	Manufactured imports / GDP	Manufactured trade balance / GDP	Manufactured exports/ total exports	Manufactured imports/ total imports
Constant	-2.919 (0.002)	2.391 (0.001)	-5.459 (0.001)	-0.083 (0.908)	4.121 (0.001)
Private credit ¹	1.596 (0.001)	0.551 (0.191)	1.353 (0.001)	1.116 (0.001)	-0.057 (0.698)
Total population ¹	-0.193 (0.018)	-0.305 (0.001)	0.115 (0.153)	0.029 (0.666)	-0.025 (0.057)
Growth rate of terms of trade	-0.004 (0.963)	-0.039 (0.535)	0.004 (0.970)	-0.094 (0.382)	-0.015 (0.392)
Initial income per capita ¹	-0.465 (0.089)	-0.097 (0.384)	-0.472 (0.121)	-0.374 (0.167)	0.047 (0.140)
Black market premium ²	-0.264 (0.720)	0.218 (0.751)	-0.678 (0.268)	-0.824 (0.152)	-0.028 (0.870)
Initial real capital per capita ¹	0.347 (0.142)	-0.038 (0.796)	0.365 (0.140)	0.279 (0.220)	-0.004 (0.932)
Heteroskedasticity robust p-values are reported in parentheses					
Hansen-test of OIR ³	0.283	2.573	1.033	0.310	0.716
Countries	65	65	65	65	65

¹ In the regression, this variable is included as log(variable)

² In the regression, this variable is included as log(1 + variable)

³ The null hypothesis is that the instrumental variables are not correlated with the error terms. The critical values (2 d.f.) are: 10%: 4.61, 5%: 5.99

Table 4: The Link Between Finance and Manufactured Trade in a 30 Year Panel

Dependent variable	Manufactured exports / GDP	Manufactured imports / GDP	Manufactured trade balance / GDP	Manufactured exports/ total exports	Manufactured imports/ total imports
Constant	-3.621 (0.001)	2.219 (0.001)	-5.565 (0.001)	-0.748 (0.001)	4.262 (0.001)
Private credit ¹	0.795 (0.001)	0.351 (0.001)	0.414 (0.001)	0.488 (0.001)	-0.029 (0.004)
Total population ¹	-0.123 (0.004)	-0.298 (0.001)	0.162 (0.001)	0.076 (0.007)	-0.048 (0.001)
Growth rate of terms of trade	0.017 (0.001)	0.011 (0.001)	0.002 (0.655)	0.003 (0.042)	0.005 (0.001)
Initial income per capita ¹	0.362 (0.002)	0.495 (0.001)	-0.072 (0.587)	-0.092 (0.370)	0.005 (0.878)
Black market premium ²	-0.448 (0.001)	0.064 (0.231)	-0.652 (0.001)	-0.835 (0.001)	-0.094 (0.001)
Initial real capital per capita ¹	-0.063 (0.432)	-0.559 (0.001)	0.418 (0.001)	0.367 (0.001)	-0.001 (0.966)
Heteroskedasticity robust p-values are reported in parentheses					
Sargan test ³ (p-value)	0.225	0.217	0.259	0.248	0.274
Serial correlation test ⁴ (p-value)	0.821	0.267	0.362	0.988	0.060
Countries	65	65	65	65	65
Observations	272	272	272	272	272

¹ In the regression, this variable is included as log(variable)

² In the regression, this variable is included as log(1 + variable)

³ The null hypothesis is that the instruments used are not correlated with the residuals.

⁴ The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

Table 5: The Link Between Finance and Merchandise Trade

	Cross-Section			Panel		
Dependent variable	Merchandise exports / GDP	Merchandise imports / GDP	Merchandise trade balance / GDP	Merchandise exports / GDP	Merchandise imports / GDP	Merchandise trade balance / GDP
Constant	-2.920 (0.001)	-1.484 (0.001)	-1.221 (0.001)	1.732 (0.001)	2.625 (0.001)	-0.851 (0.001)
Private credit ¹	0.463 (0.018)	0.457 (0.052)	0.045 (0.718)	0.244 (0.001)	0.370 (0.001)	-0.146 (0.001)
Total population ¹	-0.225 (0.001)	-0.273 (0.001)	0.030 (0.321)	-0.189 (0.001)	-0.256 (0.001)	0.032 (0.001)
Growth rate of terms of trade	0.069 (0.178)	0.002 (0.972)	0.067 (0.043)	0.010 (0.001)	0.007 (0.001)	0.002 (0.051)
Initial income per capita ¹	-0.025 (0.836)	-0.150 (0.159)	0.024 (0.794)	0.457 (0.001)	0.465 (0.001)	0.011 (0.880)
Black market premium ²	0.425 (0.335)	0.056 (0.914)	0.018 (0.920)	0.347 (0.001)	0.161 (0.003)	0.163 (0.001)
Initial real capital per capita ¹	0.023 (0.804)	0.009 (0.924)	0.074 (0.331)	-0.405 (0.001)	-0.537 (0.001)	0.116 (0.042)
Heteroskedasticity robust p-values are reported in parentheses						
Hansen-test of OIR ³	0.896	2.232	2.923			
Sargan test ⁴ (p-value)				0.209	0.376	0.174
Serial correlation test ⁵ (p-value)				0.523	0.429	0.228
Countries	65	65	65	65	65	65
Observations				272	272	272

¹ In the regression, this variable is included as log(variable)

² In the regression, this variable is included as log(1 + variable)

³ The null hypothesis is that the instrumental variables are not correlated with the error terms. The critical values (2 d.f.) are: 10%: 4.61, 5%: 5.99

⁴ The null hypothesis is that the instruments used are not correlated with the residuals.

⁵ The null hypothesis is that the errors in the first-difference regression exhibit no second-order serial correlation.

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